

University of Dundee

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Published in:
ACM Transactions on Accessible Computing

DOI:
[10.1145/2845088](https://doi.org/10.1145/2845088)

Publication date:
2016

Document Version
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

Citation for published version (APA):
Dee, M., & Hanson, V. L. (2016). A pool of representative users for accessibility research: seeing through the eyes of the users. *ACM Transactions on Accessible Computing*, 8(1), [4]. <https://doi.org/10.1145/2845088>

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A Pool of Representative Users for Accessibility Research: Seeing through the Eyes of the Users

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Abstract. A critical element of accessibility research is the exploration and evaluation of ideas with representative users. However it is often difficult to recruit such a range of users, particularly in a timely manner; nor is it easy for new researchers to understand how to recruit relevant populations or feel confident in communicating with older or 'vulnerable' users. We report on the establishment of a large user pool created to facilitate accessibility research through recruiting sizeable numbers of older adults potentially interested in taking part in research studies about technology. We suggest points to guide new researchers and invite other experts to build on these. We also sketch some of the lessons learned from creating and maintaining this pool of individuals including thoughts on issues for others wishing to set up similar pools.

Categories and Subject Descriptors: H.1.2 **Information systems:** User/Machine Systems – *Human information processing*. K.4.2 **Computers and Society:** Social Issues – *Assistive technologies for persons with disabilities*. K.4.2 **Computers and Society:** S

Social Issues – *Handicapped persons / special needs*.

General Terms: Design, Experimentation, Human Factors.

Additional Key Words and Phrases: Research participation, user studies.

ACM Reference Format:

Dee, M., and Hanson, V. L. 2015. A pool of representative users for accessibility research: Seeing through the eyes of the users. ACM Trans. Access.

1. INTRODUCTION

In the work to be described in this paper, we discuss a centre that was part of a 5 year funded UK project for research directed at the development of inclusive technologies. Our focus was primarily on inclusion of older adults, but our research group was also interested in technology development for disabled people. To facilitate evaluation by representative users, we established a large pool of potential participants, comprised of people who were willing to be invited to take part in research on technology.

When developing technologies designed to address the needs of older or disabled users, good practice requires that individuals representative of the target users be involved in the development and evaluation of the technology [Sears and Hanson, 2011]. Data collected from non-representative users, even if temporarily impaired to simulate disability (such as blindfolding sighted people during their participation in a research study), does not necessarily produce results that are indicative of how

This work was supported by RCUK EP/G066091/1 "RCUK Hub: Inclusion in the Digital Economy."

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@2011 ACM 1539-9087/2010/03-ART39 \$10.00

DOI10.1145/0000000.0000000 <http://doi.acm.org/10.1145/0000000.0000000>

representative users will react under the same conditions [Ferres et al., 2010; Sears et al. 2001].

However, finding representative users is not always easy as these individuals are often difficult to reach through standard means of participant recruitment. The challenges of finding and recruiting the population sample required is time consuming, at the very least. This is apparent when looking at accessibility studies where the recruitment problem has led to procedural practices such as repeatedly using the same research participants across related studies, simulating impairment using able-bodied participants, testing with proxy users, and employing inappropriate statistical methods to deal with small numbers [Sears and Hanson, 2011]. The implications for the research outcomes of some of these procedures can be the production of a bespoke system not suited for the target population at large, or worse, the development of a system that does not work at all for the target population.

To avoid these pitfalls, our approach was to grow a pool of people in advance of research requirements, representing a diverse cross section of older adults with a variety of physical and cognitive abilities. We developed a bank of potentially willing people and created a legacy of established relationships with relevant groups and organisations that would ensure a more streamlined and speedier route to recruitment for a range of accessibility studies. Portions of this work were originally presented at the ASSETS 2014 conference (Dee and Hanson, 2014). This paper expands upon that effort, with new contributions including guidelines, consideration of data for effective recruitment, and the streamlining of participant recruitment through the use of this pool. Guidelines may be helpful for new researchers based upon lessons we have learned over the life of the project. In this paper we are more explicit about ways of working with older populations including vulnerable users. We do not seek to teach experienced researchers anything new but to acknowledge the apparent gap in the literature for those new to accessibility or who have not yet developed the confidence or communication skills necessary for working with different populations. We offer checklists as aide memoires for such researchers under pressure and look for commonalities which alleviate the need for individuals to reinvent the wheel. We emphasise the importance of relationship building and communication as the foundation of trust and of reciprocity which overtly recognises the contribution and perspective of the users. The challenge of including excluded people in research studies requires much more than a general 'call' for participants to volunteer; it requires proactive encouragement and persuasion of people who often fail to see their worth in contributing to the research studies.

In addition we report on the importance of good data for effective recruitment of representative users and the problems we encountered after the data gathering began. The success of the user pool was dependent on data gathering that enabled us to identify participants and ensure the right people fitted the criteria for each research activity. This is what made the pool unique and our approach was informed by the inherent contradiction of trying to recruit people to take part in technology studies who have little or no confidence in the subject. Consequently this type of User Pool could not rely on self-selection as it would by default, eliminate the very people we needed to include.

In this extended version of the paper we will also weigh up the inherent time pressure facing accessibility researchers against the front loading of resources through a single coordinator and recruiter who streamlined recruiting time for multiple experiments and researchers in the long term. As will be discussed, the ability to set up and maintain this participant pool was the result of a long-term commitment to accessibility research. It is also the result of specific considerations to recruitment and retention of the participants. The pool was managed so that individual participants were not over-used, thus avoiding contamination from previous research participation. This paper will focus on these management methods, providing information needed by others who wish to similarly establish a user pool.

2. BACKGROUND

To our knowledge there are no other large-scale user pools that exist to serve the requirements of researchers in accessibility work. Nowhere in the literature was there evidence of a similar pool, managed to ensure individuals were not over-used and that

the sample fit both the research design and the different research methods employed for user engagement across a range of multidisciplinary research studies.

However, pools of participants do commonly exist, for example, pools recruited either from a discrete population such as a university's staff and students; specific subject groups, commonly, psychology departments; associations, clubs, or pools created for medical and clinical research. These may be panels recruited by marketing / survey companies who are able to get large numbers of participants, typically for survey research (see, for example, [Beach et al., 2009]). Often pools for medical and clinical research are self-selected in response to recruitment based on medical record details [Stuardi et al., 2011]. In medical research, time can be critical, with slow patient enrolment a major factor in delays, leading to the database approach to recruiting research participants [Stuardi et al., 2011]. In these clinical studies, a pool often evolves by centralising resources (in a database) for recruitment across a number of health centres to reduce costs and ensure more universal processes, protocols and systems [Cooley et al., 2003]. In medical circles they may be in a home, a clinic, a ward, or part of a medical practice where the research interests of the practice or the response of gatekeepers influences the likelihood of inclusion in a research study. Many existing pools advertise each study to all of their members, often online. In such cases inclusion is based on the first volunteers who fit the criteria. As screening is done by each individual researcher, there is no monitoring of participation rates and since the system is an online service, access to technology or a proxy is required with most of the potential participants as self-selecting. This can result in the same experienced participants regularly taking part. There also exist partnership services to share the challenges of recruitment which have grown out of, for example, a collaboration of academic and health research institutions such as <https://www.researchmatch.org/> in the USA. They encourage members of the public to volunteer to take part in research and this service interestingly, also allows *"a parent, legal guardian or caretaker may register someone under the age of 19 or an adult that may not be able to enter in their own information, but the parent, caretaker or guardian must register their own contact information"*. The researcher sends out an approved recruitment message which the clearing house routes to potential matches who can say yes or no and the researcher then receives a list of the people volunteering to make contact. The accessibility literature often publishes on the challenges of recruiting participants, and has looked for new and creative ways of obtaining participants, such as online recruitment and testing [Bigham and Cavender, 2009; Petrie et al., 2006]. As indicated, we know of no reported case of larger user pools available to a team of accessibility researchers.

The needs for testing in accessibility research are very different to testing in clinical trials. Use of technology and cognitive testing requires users, who have not been through the same or similar tests previously. The rationale for the existence of our user pool was motivated by the ability to include appropriate research participants, thus providing confidence in the usefulness of the results for the target population.

3. SIDE USER POOL

We describe here the SiDE User Pool. SiDE (Social Inclusion in the Digital Economy) is a multi-year multidisciplinary research effort involving the University of Dundee and Newcastle University [SiDE, 2010]. SiDE's remit is to address issues of inclusion for older adults and disabled users in the world of rapidly changing technologies and services. It involves research themes including Accessibility, Connected Home and Community, Creative Industries, Transport, Design and Business, with the User Pool cutting across these themes. To better understand the users' experiences and the obstacles they face in trying to access digital information and services, user-centred or participatory research and design underpins all of SiDE's research.

The goals of establishing a User Pool were threefold: to provide ready access to researchers as needed for their work across the multiple project themes; to have background information on participants readily available to researchers and to provide a group of target users who would be available to interact with researchers throughout all phases of work, from defining suitable research projects and providing early input on prototypes, to evaluating project success.

A unique feature at the School of Computing at the University of Dundee is the User Centre. We have previously reported on this Centre [Forbes et al., 2009], which serves both as a training centre for older adults wishing to develop computer skills and as an educational mechanism for students at the School who benefit from user feedback on projects they develop. As User Centre members have participated in large numbers of research project evaluations over the years, they have developed a great deal of experience and are invaluable in terms of providing students with feedback. However with respect to the types of SiDE research projects undertaken; this experience makes them often too familiar with SiDE research goals to be naïve participants in research studies.

The legacy of having such a resource available to support undergraduate students alerted us to the need for guidelines for potential new researchers wishing to work with different populations and generations. Instances of ill prepared studies by undergraduates, involving members of the public, was just one factor which informed our decision to instigate a formal request form (5.1 and Appendix 2) for researchers wanting access to participants from the SiDE User Pool. Time spent working with young researchers had already made us wonder if there may be an assumption that researchers are inherently able to set up a user study without training or experience. Research methodology text books (e.g., Lazar et al., 2010) and user experience websites such as 'INVOLVE' and the 'Research Ethics Guidebook', advise on best working practices with participants, but moving from theory to practice is never easy. We had also observed good practice, where experienced peers or colleagues would offer advice or support if asked, but not all researchers like to ask for help from colleagues. The stereotypical profile of computing students is changing but it also remains a profession which attracts people focused on the intricacies of the technology rather than on the end user; people who have high technical skills but may lack confidence in social interactions. Working with a wide variety of people is only one element of accessibility work and the challenge of finding a representative range of people to recruit in the first place is a further challenge. Robert Yin (2011) states that *"engaging in qualitative research requires establishing and maintaining genuine relationships with other people and being able to converse comfortably with them. Developing workable relationships may be the greatest personal challenge in doing qualitative research"*. With this in mind we believe there is a need for explicit guidance on user centred work which this paper hopes to initiate rather than resolve. The guidance should be more appropriately built into research methodology training.

3.1 Recruitment Strategies

Accessibility researchers have long developed relationships with local community groups or self-help groups as a means of participant recruitment. Consistent with this, our main strategy was to start with the experts working for our target populations by identifying key organisations and the senior managers within those organisations. In Scotland, the local authority has the greatest links into and across local communities. Meetings were initiated with those Dundee City Council managers who were responsible for developing strategy and delivering services to this community, those most likely to direct us to a wide representation of older adults. This yielded an extensive range of contacts in community work, public libraries, adult and community education, leisure and arts, community health, sports disability etc. Such organisations and groups helped identify likely participants, allowed us to go out and talk to them, advertised our research and agreed to respond to future calls for help. The sanctioning of our research by their managers was central to the continued cooperation of the various groups. The route from senior strategist to local neighbourhoods gave us a wider representation than if we had worked only with specific groups. We discovered that national organisations proved equally important for local recruitment, reaching people through mailing lists and newsletters and linking us directly to local support groups affiliated to the national organisation.

We also targeted age-related advocacy groups such as Age Scotland and local pensioners' forums. The latter are historically linked to trade unions and a source of this generation's older men. The need to specifically target older men in the recruitment process was motivated by two general characteristics of this age group: women outnumber men in the over 65's and men are less likely than women to volunteer [Butera, 2006; Milligan et al., 2013]. As research with the SiDE User Pool

participants expected to be looking at issues of accessibility we also actively sought out places to recruit a variety of people with low mobility, vision or motor skills. We targeted disability-related organisations and umbrella groups such as the local society for the blind and visually-impaired, as well as a skills centre for people with disabilities. Thus, the pool primarily comprised able older adults, with an over-sampling of individuals who had a disability.

Initial marketing strategies included local media advertising, distributing flyers, leaflets and posters, online registration through a website, telephone access and paper registration with a freepost address. These methods work well for users of technology with reasonable levels of confidence. In addition to a brief description of the project our leaflets included a membership form for people to complete giving their name, date of birth and contact details, and an email address and mobile phone number if applicable. These could be returned to the User Pool manager using a freepost address; a small proportion (146 people, 2010-2015) of the total membership used the online registration form. In order to supplement recruitment the User Pool manager made contact with the key managers, convenors, group leaders or organisers of the above organisations in order to recruit people personally. In most cases this would involve a general presentation followed by chatting to people individually. Sometimes it would involve taking a stall at an older adult's event along with other organisations advertising services for retired people. Additionally the manager became socially proactive in cafes, garden centres, health centres and supermarkets using SiDE User Pool promotional material, if an opportunity presented itself. In addition, 'give-aways' were used to increase community awareness of the SiDE User Pool. These included free pens, note pads, and key fobs with trolley coins that were given out at events. Participants were universally delighted to receive 'freebies' with good pens *'always useful'* and the key fobs the most desirable item.

From talking to people we discovered early on, an important assurance for potential participants was their initial agreement to join our pool only allowed us to call them. They would be willing to listen to the research proposal and only then decide if they would take part. Talking to people directly was particularly important given the research focus, and being allowed to call them was the first step. Recruiting high numbers of people excluded from, or with low confidence in, using technology is a difficult task. There is an inbuilt contradiction in trying to recruit refusers, reluctant, low or non-users of technology to take part in research specifically looking at the application of existing, new or emerging technologies. Advertising alone is unlikely to persuade them and it is counter intuitive for them to volunteer in a field they lack confidence in, especially for a highly skilled discipline within a university context.

Through regularly talking to User Pool members a potential barrier was identified by the User Pool manager, which was the phrasing of an inquiry to discover if the participant fitted the criteria. For instance, when asked directly if they used new technologies a User Pool member would often deny any technological skill or experience. With careful probing the manager would often discover they had mobile phones, digital radio, camera and television and other household objects they routinely programmed and used to fit their needs and lifestyles. 'Technology' was a word they understood as a complex system in which they lacked confidence or felt sure they could not use. This level of detailed feedback, from the potential participant, was made possible through direct communication, usually by telephone, often encouraged through the use of age appropriate comparisons giving a context easily related to by a particular generation, using common cultural reference points. Large numbers of the pool would never have volunteered to take part without this conversation to explain to them why they fitted the criteria and the data regarding their technology use and experience would have been invalid. Appendix 1 provides some of our solutions to persuading over 65's to take part.

3.2 User Pool Composition

Information about participant numbers for the SiDE User Pool is shown in Table I. The initial objective at the University of Dundee was for a SiDE User Pool of 8–900 older adults aged 65 and older. Between 2010 and 2012 a pool of over 800 individuals was established. Since the end of 2012, a proactive recruitment drive ceased, as demand for the User Pool slowed down and (a finite number of) SiDE researchers followed the cyclical nature of research and moved into data analysis and writing up

findings. At about this time we decided the pool was large enough to respond to most current research requests. In the latter two years of recruitment (2013-14) the balance of new recruits was entirely driven by demands of current research studies and their related specific inclusion criteria. Enough community relationships were established to allow new recruitment targets if there proved to be a demand for them. We discovered this to be a sensible approach as members continued to enrol through both the application form/leaflet and the online registration route. It ensured our existing hundreds of members in the pool were involved, while at the same time we did recruit very specific populations for studies requiring participants with more explicit characteristics and exact criteria when needed. In 2013, an update of participant details was conducted to clarify continuing commitment, update contact details and any inevitable changes in availability/health for this population; resulting in a bank of 702 participants representing several counties throughout Scotland, with outliers across other regions of the UK. In 2015, we are again auditing the database and renewing our contract with User Pool members to clarify their relationship with us.

Table I. SiDE User Pool Membership Numbers

	Number
Peak membership (Fall 2012)	817
Total membership (2010 – 2014)	863
Current membership (Spring 2015)	645
Withdrew (2010 – 2015)	215
Participated in 1 or more research studies	697
Participated in 1 or more studies at the university	642

Recruitment to the user pool targeted people aged 65 plus and although age was the key factor, younger people were recruited for comparison studies and some people with specific physical or medical conditions were actively recruited for accessibility projects regardless of age. We found that many older adults in the User Pool were busy people with responsibilities as carers (for grandchildren, parents or spouse) and/or involved in voluntary, physical, social, creative or educational activity. Many shared the significant characteristic of active engagement in local life. The SiDE User Pool also includes partnerships with national and local advocacy groups representing people on age, health and issue-based topics such as Parkinson's UK; Celebrate Age Network and the Royal National Institute for the Blind (RNIB). In contacting organisations to recruit potential participants the User Pool Manager would seek advice on research procedures and follow the relevant necessary protocols for each target group. However in working with people with particular physical or medical conditions the appropriate ethical procedures would be followed by the researcher concerned, with the manager as the conduit to the likely places to find recruits. Our outreach ensures robust user inclusion and has resulted in links into the community and 30 relevant organizations enlisted during the initial recruitment years.

In terms of being representative of the population, the pool fell short of including any genuine representation of the oldest old, people living in sheltered housing or care homes, older adults with very high support needs or older adults from minority ethnic communities. The reason for these limitations were a direct result of the kinds of studies we were conducting, none of which related to the populations described. It is inevitable, in research recruitment, that volunteers for research studies are still likely to favour the more confident, and those with high school and higher levels of qualifications. When recruiting we did however proactively target neighbourhoods to ensure that all socio-economic backgrounds were represented in the SiDE User Pool. We used the Scottish Index of Multiple Deprivation to analyse the postcodes of 742 members, matched against the indexed areas shows that 10% of the user pool, aged 65 and over, lived in areas within the 15% most deprived areas of Scotland and 17% (or

over one sixth of the user pool membership) lived in the 0-30 percentile areas, representing social classes D and E [SMD, 2012].

3.3 SiDE User Pool Data and Characteristics

At the outset, one of our goals was to have data on background characteristics of the research participants. In the first instance all User Pool members were universally categorised by date of birth, gender, name and contact details. This information was gathered at the registration stage through a basic form. Date of Birth was a fundamental requirement of the SiDE remit and an immediate check on their fit for our studies, while their post code was an indicator of socio economic status. If they gave a mobile number and email address we knew there was some level of technology adoption (Appendix1).

Further information was gathered by the User Pool manager, when contacting people by phone to recruit them for specific studies, using a simple checklist of common technologies everyone could relate to and other new technologies they may have experienced, to add further detail to the data. Over time it was a matter of course to update information when recruiting people for new studies, as we would expect people to change over time, so pertinent details were updated using phone interviews to ensure they fitted a particular study criteria, thus this level of data gathering throughout the pool's life was an iterative process.

As well as basic registration data our goal was to have more detailed information on individuals and with this in mind we collaborated with the CREATE team at the University of Miami Miller School of Medicine and the User Pool manager ran these studies [5.4 and Czaja, 2006, for detail]. Given a shared goal of interest in cognitive abilities of older adults in relation to technology, we used their cognitive measures and technology experience and abilities test batteries to record comprehensive background information on 188 of our participants. The goal was the sharing of data between the two sites, with the potential for joint research that would come from a common base. It should be noted, however, that some of the test items from the CREATE battery had to be adapted for the UK, in particular cultural references and language. Together with data gathered through the recruitment process we had a snapshot of characteristics of the SiDE User Pool, providing similar data from the CREATE sample population. It is important to realise that these data are exactly as indicated -- a snapshot in time. Several of the cognitive tests in the battery require updating after a couple of years to be accurate measures. As some of the SiDE participants were tested at the very beginning of the SiDE User Pool and others were tested later, not all the data accurately reflect the current state of participants in the User Pool. This was also true for data collected while the User Pool was being established, that is, during the initial phase of recruiting people into the User Pool [Dee and Hanson, 2014]. So when individual studies took place, particularly those reliant on specific information such as the results taken from cognitive measures, the participant information was updated. In such cases, where appropriate, the user was retested to discover their current score as the researcher was likely to be looking for participants with different levels of fluid intelligence, for example, in order to test whether this impacts on study results [Trewin et al., 2012; Crabb and Hanson, 2014].

All paper applications and registration details were available only to the User Pool manager and filed in a locked cabinet. Only the User Pool manager had access to database information until a 2013 audit (3.4) when access permission was sought for some of the SiDE–Dundee researchers to recruit their own participants. In reality the manager remained the gatekeeper as she still administered the database and had accrued knowledge about many of the User Pool members. The data base was password protected and backed up on a locked hard drive. Paperwork from the CREATE studies were coded for anonymity and stored in a locked cabinet with access only by the User Pool Manager. Individual scores from CREATE tests were added to the database using anonymous codes and not named participants. Researchers could access scores via a research activity linked to an anonymous code and not a named person.

3.4 Participant Selection for Individual Research Studies

Between January 2010 and December 2012, when the most substantial part of the SiDE User Pool was established, only the manager of the pool had access to the database. This was a direct response to the keenly expressed concerns of the target population worrying about cold calls from strangers and anxious about their privacy

and security. In early 2013 we conducted a formal audit of the user pool to update our membership information and move away from single point of contact (SPOC), passing responsibility back to individual researchers to recruit their own participants, albeit through an existing pool. We used the audit to seek permission from SiDE User Pool members to allow SiDE researchers access to the database to recruit their own participants and specifically invited people to remain in or withdraw from the User Pool via free-post print form or email. We expected to lose people from the pool; however we were gratified to discover that less than a handful left in response to this new factor, while others left for a much wider range of reasons including health, geographical location, other commitments or simply loss of interest in working around the subject of digital technologies. With hindsight we believe that acceptance of this new agreement, allowing SiDE researchers access to participant contact details, was due to a level of trust built up through a relationship centred approach to recruitment during the first two years, as described in 3.1. People could still say no and were comfortable with that. Our researchers reported that when recruiting, once they had quoted the names of the project, the university and the manager, respondents were reassured and cooperative. While it was only our current experienced researchers who had access, they still completed a User Pool request form (5.1 and Appendix 2) for new experiments. All other new requests were still processed through the manager to ensure participant security concerns remained protected.

Without a user pool the alternative for SiDE would have been dozens of researchers approaching the same organisations throughout similar time frames and most likely using the same enthusiastic individuals. A SPOC for User Pool participants and partner organisations was an advantage in the first years of establishing and maintaining links and recruiting large numbers of people into the pool. It made life easier for participants coming into the university as they knew a name or they were looking for a study involving older adults or people with disabilities and were directed to the manager upon arrival. Many older people from the local community are unfamiliar with a university setting and nervous of visiting an academic department – especially where the expertise is something highly technical. Making every effort to meet them and make them feel at ease is important, and a backup person to catch late or lost people is helpful. If the participant is uneasy at the outset, confidence can be undermined and their ability to relax in the experiment affected.

The process for selecting participants for specific research studies, as indicated, followed a procedure that started with an individual researcher's User Pool request form (5.1 and Appendix 2). It required the researcher's details (including user profile, methodology, jargon free description) enabling the manager to identify candidates fitting the researchers' study design and participant profile. Likely candidates for participation would be called by the manager to explain the study to them and describe the profile needed, but these conversations were both functional and social. In terms of the latter they offered an opportunity to follow a natural social exchange which might include the weather or topics of local interest often opening a channel for the participants to double check the nature of the work and clarify their own understanding. In terms of the former the phone calls aimed to determine if the person matched the research study inclusion criteria but most importantly to ensure the potential participant fully understood the nature of their participation. The 1:1 connection, including polite social conversation, was reassuring, counteracting the 'cold call' effect, resulting in more older adults willing to listen and to positively consider taking part. It also allowed the manager to hear concern or reluctance in a participant's voice and act accordingly by actively assuring them that our large pool gave us plenty of flexibility thus encouraging people to decline if they were uncomfortable. It also enabled the identification of misconceptions in a user's expectations and for us to discourage participation at an early stage, when necessary. We believe it has been a key factor in the retention of participants in the SiDE User Pool over the past five years resulting in the very low accretion compared to other research pools [Patel, 2003].

3.5. Maintaining the User Pool

One of the biggest challenges of managing a large pool of potential research participants is maintaining their interest, keeping them up to date and creating the right 'conditions, atmosphere or milieu' to help them feel part of a relatively coherent

group over a long period of time. In part, this happens naturally especially when there are intense periods of time where there is high demand for user interaction and plenty of opportunity for the phone call conversations and the social exchange described above. In truth it was something we knew would help to keep the pool together but we were not sure how we could sustain a proactive effort and commit the resources we imagined we might need to do this. As the User Pool development started in 2009 with outreach actively in place from January 2010 onwards we have always been concerned to ensure that people listed in the pool remain 'active' (i.e. willing to be invited to take part) and for this reason we audit the pool at broadly two yearly intervals by contacting everyone and inviting them to stay or withdraw.

However over and above this we realised it was necessary to proactively engage with the whole User Pool by keeping them abreast of SiDE's work via a newsletter and two websites, the wider SiDE project work at www.side.ac.uk based at Newcastle University and the participants' own specific website at www.side-dundee.org.uk used to disseminate current and past research studies, house an electronic version of the User Pool Newsletter and alert them to events, news and emerging research projects. News and information for User Pool members has always been made available in both print and digital formats because, from the earliest days of SiDE, we understood the importance of print over digital for many of the User Pool members. Our approach appears to be valid today as the results of the Pew Survey in 2014 found that our target population still face a number of hurdles in accessing new technologies, such as physical conditions and health issues which act as a barrier, scepticism of the value of new technology and difficulty in learning to use, and finding support in using, new technologies [PEW, 2014]. The SiDE newsletter (see: www.side-dundee.org.uk) was very important as a consistent link out into that community, acting as a vehicle for our print questionnaires which we distributed with it (e-versions available on the website). However, a significant number of people in the User pool did use email (68% of the pool gave us email addresses) and when we interviewed or questioned them about technology use they consistently referred to email as one of the best aspects of their technology adoption [Dee and Hanson, 2012] but they were equally clear about how and why they used it. It was a free tool for wide communication and they used it purposively usually limiting the times they checked it. The message from them was that they ruled it rather than the other way round. We found that for some people it was a preferred route, following telephone calls, to confirm schedules and clarify details around research studies as they could check it in their own time, as needed. However when it came to reading any amount of copy, the majority preferred a print version. So email did play a role as another communication method which we employed to keep in touch with some people in the User Pool.

Earlier in this paper we referred to the establishment of a SPOC and certainly at the beginning, in setting up the User Pool, this human link was very important. Her contact details appeared on email communications with a direct telephone link, at the end of every newsletter and when sending out confirmation of specific research participation (or car park passes and maps) her details were also included to ensure contact could be made when people had to cancel or they got lost. The User Pool manager's name also appeared on the Freepost address for the return of questionnaires or feedback forms. Subsequently it was not unusual for User Pool members to contact her for all sorts of reasons that might relate to a previous conversation or seek guidance regarding access to IT support or even for a chat. In the latter case it was generally sparked by correspondence received from SiDE giving them a genuine excuse to 'legitimately' make contact. It was also in recognition of the stated fact, by this generation, of their frustration of often having to cope with machine answering when they felt a quicker and more efficient method was to talk to another person. It remains another type of link with this community that developed through the pool and is a further consequence of the relationship building discussed earlier in section 3.1, 3.4 and which we will return to in 'lessons learned' in section 5.

One related aspect of involving the user in accessibility research is the further challenge, after participation, of convincing users of the importance of their contribution to research.

We organised a Celebration Event which aimed to give them feedback on the work they had been involved in, pitched at a series of different levels to appeal to all aspects of engagement and centred on the work of research participants from the SiDE User

Pool. In keeping with the relationships developed and as a courtesy for their contributions over 5 years we had also to explain funding was ending and demand for their input would diminish. We planned carefully for an event to actively showcase the role of users in our research with a focus on accessibility and creating a comfortable setting for people to come into the university to a research event. Everyone involved was primed on the atmosphere and conditions we wished to create. The environment of the building is academic in layout and we consciously created enough spaces and distractions for people to feel at ease. The majority of people attending were individuals and entering an event on your own can be daunting, so we created a front door reception area continually staffed with friendly faces to meet and guide everyone in, and with people available to advise them on parking or accessibility if needed. Cakes and hot drinks were immediately available as they arrived, served by friendly peers and the walls nearby had bright A4 cards with short quotes from researchers to give people a distraction if they needed it.

Small booths were set up around the hall with posters, presentations, various artefacts, scrolling PowerPoint presentations and researchers stationed at each one to demonstrate their work in as accessible style as possible but also armed with full research detail if questioned at an academic level. 12 researchers and 2 representatives from SiDE at Newcastle University attended. A further 8 researchers (Glasgow, Aberdeen, Newcastle and Dundee Universities) sent in posters, quotes and appreciative endorsements of their experience of working with SiDE User Pool members. Refreshments were available throughout the day and a small hot lunch was provided with a choice of drinks. 'Speeches' were kept to a minimum and concentrated on reminders of the importance of users and thanks from senior personnel. A separate room was set up with tables and chairs arranged to encourage people to socialise and give them a place to eat comfortably. A scrolling presentation ran in this room, consisting of a few bite-sized facts about user's involvement, interspersed among a litany of 90 photographs of participants in action throughout various SiDE studies 2010-14. This offered an easy conversation opener or distraction for people and it also helped to emphasise the breadth of their involvement.

We provided post cards with empty speech bubbles for them to fill in to gather feedback from research participants' point of view about what had worked and what could be improved. We wanted critical input from them as users. However all of their written feedback was hugely positive. We suspect that those people who attended (91) were probably the most motivated participants (one travelled overnight from Nairn to attend) and many of the replies we received (197) expressed regret that they were unable to attend. The event was very successful and providing space for people to talk, away from the busy interaction and noisy acoustics was a really good idea. It also created a space where the many single people who came, were effortlessly drawn into conversations with others, an observation that came from other participants. We used our researchers past and present, at the event to try and discover anecdotally some more insights into the experience from the user's perspective. They observed the pleasure people displayed hearing about research outcomes and the number of times they commented how good it was to see research they could imagine being used in everyday life and how they would have enjoyed taking part in that study. This was the main 'criticism' that people wished to be a lot more involved and to take part in more research studies. The people who attended were from across the spectrum, one wheelchair user and a couple of people with walking aids. There appeared to be no specific characteristic such as younger, able bodied representatives and as mentioned earlier, the majority came on their own and stayed for the duration of the afternoon. We offer one of the feedback quotes as an example:

"It was stimulating to be part of the pool. Being asked to come and take part in an experiment really did give the idea of 'being included' even when retired. All the personnel involved were delightful people, a pleasure to spend time with. I felt it was useful to be involved in a project with so many potentially useful outcomes."

4. EXAMPLES OF SiDE RESEARCH

Between 2009 -2015, 51 individual researchers made use of the pool for a range of studies using a variety of research designs and methodologies. To date, 697 members of the SiDE User Pool have taken part in at least one research study, and there have

been over 2000 participations by members of the user pool visiting the university and responding to research questionnaires sent out to them. These participations were actively managed by the User Pool manager to ensure that a subset of people did not become regular volunteers. No one person was invited to take part in the same or similar studies nor were they able to take part within the same annual time frame, unless responding to questionnaires or a completely different type of study, and even then those rarely or never involved were recruited as priority.

Table II gives some examples of the work to which they contributed. To give a sense of the breadth of this research, we discuss here a sampling of the studies conducted. One of the interesting efforts was an early one-day SiDE workshop convened to give early input from users to the broad discipline based group of SiDE researchers. To provide feedback from users representing different views, we assembled four user groups:

1. Older adults who had no interest in technology
2. Older adults who were willing to use technology, but it had to be very relevant to their lives to bother with it
3. Older adults who like technology
4. Technology transfer specialists

The first three groups were from the SiDE User Pool. The 4th group was specifically assembled for the day. Throughout the day, representatives from the SiDE research areas pitched potential research ideas to each group of 6 – 8 participants. This was done on a revolving basis so that the research groups moved from one user group to another, getting feedback on their research ideas from each group.

The eye-opening aspect of the day was user group #1, the no interest in technology group. It is common for technologists to be enamoured of technology and its potential to enrich lives. This vision, however, may not be shared by target users. Many researchers were surprised to meet a group of representative users who could not see the value in the ideas pitched.

Table II. A listing of sample research studies conducted with the SiDE User Pool

Research Method	Example students - references
SiDE Workshop	Reported in Dee & Hanson (2014)
Focus Groups	Guo, 2010; Medellin, 2013; Vargheese 2013; Norval, 2014.
Co-Design Workshops	Nevay, 2014.
Questionnaires / Surveys	Morrison, 2011; Stewart, 2013; Heron, 2013.
Interview	Dee and Hanson, 2012; Nind, 2013; Dee, 2014.
Experimental Studies	Bachu, 2011; Montague, 2012; Trewin, 2012; Nind, 2012; Heron, 2013; Crabb, 2013.

The SiDE User Pool has been used for a large number of focus groups. These studies helped inform work on topics as diverse as in-vehicle systems for older drivers [Guo et al., 2010], social networking for older adults [Norval et al., 2014], and older adults' technology use and conversational support systems when engaging with BBC radio discussions [Medellin-Gasque et al., 2013].

The BESiDE project aims to examine how the built environment contributes to the health and well-being of care home residents [McIntyre and Hanson, 2013]. In preparation for data collection about activity in these homes, co-design workshops were conducted with SiDE User Pool members [Nevay and Lim, 2014]. These workshops provided early input about acceptably wearable devices for older adults in preparation for going into care homes; results of these workshops with SiDE participants were then used to conduct co-design workshops with care home residents.

Questionnaires and surveys have been a popular method for getting information from large samples of users. Throughout the first few years of the SiDE User Pool

several surveys were distributed both online and in print (with a freepost envelope). Some responses were obtained solely online, but the print versions yielded the highest response rates (63%, 56.5%, and 52% respectively, 2010-2012) and we learned to use both mediums to ensure universal coverage and the widest reach. Sample surveys included questions about options for use of mobile phones as memory aids for older adults [Morrison et al., 2011] and support for online health information searches [Stewart et al., 2013]. Response rates varied decreasing after a couple of years. Comments suggested lack of enthusiasm related to the repetition of questions across the various studies, as was inevitable when conducted by different researchers across a number of years. Each researcher needed to ensure their data was current so our lesson here was to remind researchers to explain why some people may feel they are repeating the same survey questions. While direct interaction with participants was a more common methodology for the User Pool than questionnaires, on occasion when participants came to the university to take part in research studies a questionnaire was used as an element of the study too. For example, participants were asked questions about the acceptability of Open Source software as used by older adults [Heron et al., 2013] and about technology adoption for this population [Vargheese et al., 2013].

Individual interviews were often conducted with SiDE User Pool members in conjunction with other studies. In a few cases, however, interviews were the main research method. In one case, older adults provided online interviews about their experiences with technology [Dee and Hanson, 2012]. More recently, research in connection with the BESiDE project used interviews with visitors to care homes to help understand aspects of the built environment that facilitate social interactions in these homes [Dee, 2014].

The SiDE user studies were not the first to use eye tracking with older adults. There hasn't however, been a lot of work with this method for this population. While the method presents challenges for use with older adults, research was conducted with SiDE User Pool members that examined their eye movements when looking at website information in a variety of web information seeking tasks. These studies found differences, for example, in how older and younger adults enter search terms and develop strategies when using search engines [Hanson, 2010] [Trewin et al., 2012]. Experimental studies were the most common methodology used with SiDE User Pool participants and also the most time demanding for the manager. Examples of studies with User Pool members included research with disabled users on cross-platform adaptations for users with visual and mobility disability [Montague et al., 2012], new television interactive controls for older adults [Bachu and Hanson, 2011], user interface designs to facilitate information seeking by older adults [Crabb, 2013], computer input adaptations for older adults [Heron et al., 2013], and information cues for online health seeking by older adults [Nind et al., 2012].

5. LESSONS LEARNED

Our experiences with the SiDE User Pool resulted in several lessons learned that might be useful for others contemplating developing and maintaining a user pool, at this or another scale.

5.1 Request Protocols and Processes

Establishing a User Pool comes with its own risks, emerging over time and through experience; the most obvious related to high expectation and instant gratification. With a pool on site (or on tap) researchers may expect the route to people to be instantaneous and ubiquitous, requiring minimal thought or planning on their part regarding the reality of a user based accessibility experiment and an expectation for the pool to be universally accessible to all researchers. As the User Pool became more established and relatively high profile, there was, at times, a temptation to short cut through the manager and abdicate the researcher responsibility in taking ownership for the user-centred element of their research. A formal process was therefore important on many levels including a sign off for student researchers by their supervisor as the lead authority able to comment on research protocol and quality. The User Pool manager was just that, responsible only for the pool of participants.

Consequently researcher requests for participants from the SiDE User Pool were initiated through a User Pool request form (Appendix 2). This fulfilled a number

of functions: as a checklist for the researcher, as a focus for the researcher on the role of the users in relation to the type of study and methodology being used and as an impartial device for the User Pool manager to query and clarify fine detail. Information describing the researcher's experiment, planned methodologies, recording equipment, numbers and the required participant characteristics, together with a copy of their participant information, consent and ethical approval forms were required. The completed request form was followed up by a discussion between the researcher and User Pool manager to clarify specific information. (Appendix 3)

This simple process smoothed the way for the manager, through a series of information steps, to more easily find the right people in a timely fashion and to act as a gatekeeper to the users. For example, requests to send out an email questionnaire to the whole research pool were common but not always thought through, and when queried needed refining to exclude some participants based on certain characteristics, such as low vision. As initial recruitment would be by the User Pool manager, a jargon-free briefing of their planned study was also required to ensure that people understood what they were signing up for and that the manager did not influence the participant's behaviour or attitude when joining the study.

The User Pool manager understood her role to include responsibility for the care and consideration of people in the pool and of their comfort and safety when they visited for a research study (Appendix 4). To that end she was proactively involved in the preparation, planning and organisation of the users' experience (bar sitting in the study with them). Inviting them in, checking the venue was suitable with the researcher, clarifying meeting points and making sure they were able to travel easily to the agreed place and troubleshooting where possible with delays or long waiting times. Such details were important to ensure a professional experience for the user and over time, walking through plans with researchers, it became useful to make some observations summarised in Table III.

Table III Getting value from user involvement

MAKING THE MOST OF A USER POOL	
TIME	<ul style="list-style-type: none"> • The process always takes longer than expected • Expect the unexpected, as it will happen. • As fluid a time-frame as possible is necessary, when working in accessibility research, to deal with unexpected factors
METHOD/ DESIGN	Once working with participants, you may learn that original plans demand a rethink of the research design to ensure the data gathered is valid e.g., the exercise is too difficult for the users
WASTING VALUABLE USERS ALWAYS PILOT YOUR IDEA	<ul style="list-style-type: none"> • If the experiment has not been piloted to iron out any problems, the researcher may waste all of the relevant representative participants, for their accessibility work, just testing equipment. • Asking for a very specific user profile may prove to be too ambitious, impossible to find, or result in very low numbers. • If numbers are low save them for the experiment, where as far as possible the researcher can guarantee everything will work well
SEEING THROUGH THEIR EYES	Sensitivity is vital in forward planning especially when applying <i>strict health criteria</i> and <i>age range</i> to the potential participants. It is likely that more arrangements are likely to be needed in such cases, e.g., when parking for people with disabilities is too far from an entrance and university level clearance is needed to park closer
PERSONAL CONTACTS	Although it takes more time, personal contact with university personnel, local groups and/or phone screening, when recruiting from 'rare' populations' works best, resulting in higher recruitment numbers, more precise fits for studies and appropriate support from university bureaucracy.
TIME	Time is the key to getting it all right. None of this can be done in a hurry. FORWARD PLANNING will pay dividends

5.2 User Pool Resourcing – Staffing and Management Issues

The success of the SiDE User Pool was enhanced by the ability to have a full time person to manage the pool for the first three years. We recognise, however, that the ability to hire an individual to fill this role is generally not possible. We present the following information about the manager role and interactions, as suggestions for best practice in recruiting and testing research participants, particularly in accessibility

studies. In noting the advantages we also attempt to think of ways in which others might take up this idea without the investment of a full time manager for 3 years.

The responsibilities of the manager's role included recruitment into the SiDE User Pool, database management (ensuring full participant contact details, characteristics, and study activities were correct and updated in the database), enrolling people for research studies, complying with research needs, typically meeting and greeting participants taking part in studies at the university, and running some studies. The SiDE User Pool manager was of a similar age with User Pool members, having empathy with them through comparable life experiences and shared cultural reference points. This was an advantage given the nature of SiDE research into rapidly changing digital technologies which many of the potential participants were uncomfortable with or nervous about. Liking people, good communication skills, unafraid to go out to forge links, meet, talk and persuade groups, organisations and individuals to take part were all important

The approach developed by the SiDE management team, to establish a large representative user pool to support a multidisciplinary set of research studies, did streamline recruitment time, as described below. The frontloading of participant recruitment and the concomitant data-gathering created a significant resource and service that freed up researchers to focus on their area of expertise without having to think too much about actively seeking and recruiting users to take part in their studies. The luxury of having over 800 potential users saved research time for over 50 researchers, resulting in 42 user based research studies, not including studies organised and conducted by the User Pool manager or 9 questionnaires created by researchers or the CREATE based battery of group measures which were conducted, scored and added to the database by the User Pool manager separately. This service provided researchers with extra time, more fulsome data, allowed researchers to hone their interpersonal skills with members of the public and to focus on their specific data gathering and analysis. It also ensured access to users who were representative of the wider population they specifically wished to target. Interestingly the academic literature does not require a researcher to justify the representative nature of their participants. Reporting on participants generally appears in the methodology section and often refers to numbers and gender balance, ticking the user involvement requirement of accessibility work.

The following rough estimate is an indicator of time saved assuming we are looking to measure the basic time needed by 30 researchers to recruit representative people for a research study (consisting of a pilot, and 2 experiments). If we assume 30 participants per researcher per research cycle (6 for the pilot and 12 each for the 2 experiments) and that recruitment, even with an existing pool, can take calls to triple the number of potential participants (90) to get the requisite number, we need to estimate the time this might take. If we factor in 15 minutes to chat to those 30 they actually make contact with and recruit, in order to explain the study and let them check diaries, this adds up to 450 minutes or 7.5 hours, simply phoning existing contacts for one researcher. Multiply this by 30 researchers and you would have to expend 13500 hours or 5.25 working weeks just to find people for each of them to run this one research study. If you then factor in a further 60 phone calls per researcher to cover those unable, unwilling, unavailable etc., and allow 5 minutes each to include finding their contact details, no answer, wrong numbers and those you have a conversation with but are unavailable, then this adds up to 300 minutes or 5 hours per study which results in 12.5 hours just calling people already recruited into a pool for one researcher for one research study. Multiplied by 30 researchers this adds up to 365 hours, 46.875 days or 9.375 weeks.

Bear in mind that in this calculation, communication links, trust and any relationship building are already in place. Thus we do not include time spent searching for relevant sources of representative users, since in addition to 800 individuals there are 30 groups/organisations, with contact details, willing to be invited to support research studies. We do not include time for re-phonng to catch people at home or for them calling back to confirm, or time spent answering queries, sending out directions, car park passes etc. Neither does this factor in the usual eventualities that come with working with people, such as finding replacements for participants suddenly unable to take part or failing to arrive. It is clear that these calculations are under-estimates as we should really include relationship building as advocated by HCI professionals (Yin,

2011) in order to keep the study user centred. In reality, without a User Pool, there would also be the finite time and increased numbers of participants needed when conducting research cycles which involve pilot studies, prototyping, trialling, evaluating, eradicating problems and reviewing, retesting and repeating elements of the cycle. Without the pool there would also be the large duplication of time spent by individuals probably mining the same usual and more obviously accessible groups of people.

How could others then learn from this experience and create a User Pool without investing in a full time permanent manager? If we acknowledge the importance of strong relationships to lead to a network of contacts and the build up a database of user profiles and characteristics, then front loading investment in one person on a short-term contract could be worth consideration. It would ensure inbuilt good-will based on established relationships for the longer term so that recruiting time for multiple experiments and researchers is streamlined with a communication bridge for all parties back and forth. If this remit also included established monitoring systems, to ensure a more representative set of participants, then the resource might thereafter be managed by a team of researchers. It would be an interesting exercise to find funding for a 12 month (or equivalent e.g. 24 month part time) investment in a staff member to set up the basis of a pool and establish links to, and relationships with, organisations, as well as set up the protocols and processes. As a limited tenure it would have to include future planning of organised protocols, for data collection and an agreed recruitment process. However it would be important for the wider team to take ownership of the responsibilities for maintaining the pool and the database once established and the manager steps down.

With a series of strong processes in place and a good database, it is possible that the pool might be managed by a team of researchers. There is strong personal and professional motivation for researchers to invest commitment in such a pool and it could possibly be a cross-university project or even a multi-university approach. However, it might be worth considering the role of a coordinator as a responsibility that is circulated each year so that there is always a named person ensuring clarity and adherence to the philosophy behind an accessibility pool. It would also be important for wider team ownership to support the coordinator in the responsibilities involved in maintaining the pool and the database. Otherwise the good will and relationships, established in the first place, might suffer if the pool is simply a quick fix to recruitment for researchers in a hurry, impacting on retention and leading to a greater likelihood of increased loss of User Pool participants. Without clear processes and protocols, that also include maintaining regular communication, it is unlikely that the membership numbers could be sustained.

In relation to the idea of devolving User Pool management to a team of researchers there are existing examples of research pools, used in academic settings, especially in psychology departments, where they recruit post graduate students to establish a pool of their peers from across the department, or university. The student organiser can gain credits for the work involved [Hepting, 2006]. Although in such cases they are generally recruiting people from within the safe confines of the university institution itself, it is not a great leap of imagination for something similar to be developed with a wider remit for recruiting representative members of the public, using an administrator as the initial face for the public, as long as there is an understanding of the need to keep the users at the centre of any planning. This not only creates training and development opportunities but is also a significant public outreach exercise to involve local people in the work of the institution.

A core team of people would be responsible for ensuring the database was fit for purpose and that data input followed established regulations. The success would lie in the robustness of the database and the ease with which relevant information could be mined to ensure the right people fitted the right study and that the more willing participants were not over used. The challenge would be in maintaining the interest of the pool as a whole and, without a coordinator, exact ratios of use would have to be laid down if many individual researchers were accessing the data to recruit for various studies. 800 people sounds like a lot of participants but when the demand is high and other variables are included like people's availability and eliminating people for over-use, age, gender, ability, illness and various other criteria the numbers soon decrease.

We suggest a checklist as useful as a prelude to setting the user at the centre of considerations by individual researchers:

Preparation for a User-centred study:

- Personal contact - use phone calls to invite likely candidates to take part.
 - Allow plenty of time to recruit enough people
- Scheduling time when lab/room/equipment is available with no interruptions
- Timescale is realistic to schedule participants, avoid keeping people waiting
- Reminders/ confirmations of time, date, place with maps, parking pass, bus routes etc.
- Planned experiment is doable and not setting people up to fail.
 - Experiment tested/timed with people prior to users being invited in.
- Advance checking of all equipment, prior to the day and on the day.
 - Participants feel responsible when I.T. fails
 - Irritating if rearranging furniture when they arrive on time
 - Paperwork organised: systems for ethics, permissions, signing off
 - Person to direct, meet, inform them
- Suitable space size; accessibility; seating; windows; blinds, lighting, acoustics
- Practicalities, e.g., tea, toilets, heating, car parking, pens
- Awareness of the financial impact of your study on participants.
- Sensitivity in use of language especially when describing particular groups or characteristics.

Preparation for participant testing takes a significant investment of resources and time that can be underestimated by researchers (See Table IV). With older adults and for accessibility studies in particular, preparation starts at the selection stage in order to clarify needs in terms of participant access to the university. Maps, car parking passes, one-way systems, bus stop locations, building access, location of doors, lifts and seats for waiting, are all important when inviting older or participants with disabilities to an unfamiliar place. Make participation as simple as possible for participants by confirming time, date and place of the agreed study; send maps, bus numbers and timetables via their preferred communication method; a prudent safety net, bearing in mind the vagaries of postal services and the demands on, what we discovered to be, a busy population. Careful scheduling to ensure enough experiment time to avoid keeping other participants waiting is a challenge when participant skills may vary and affect timings. With a wide range of people taking part there can be significant differences in the time taken to complete a study and scheduling multiple participants on the same day may result in participant queues. Once in the building, the research study environment is important for people unfamiliar with lab or academic space. Offering a non-threatening, quiet setting with no interruptions, a drink, a choice of seating and good turning space can be a good investment of study preparation time.

All of this is important to ensure that the participants feel they are part of a professionally managed research study and they can trust the process and the organisation the researcher represents. If the participants feel uncomfortable, unsafe, disrespected or foolish they not only withdraw their cooperation, but they also give negative feedback to others in their community. We have found, in general, that the university brand is a good one (through feedback from participants when we speak to them) and people trust its reputation for serious study. This is only true, however, if they have a safe and interesting experience when they participate in the research.

The observations in Table IV are borne out of the years of working with researchers who, although fully committed to user-centred research, may not yet have their social antennae or emotional intelligence finely tuned to the centrality of the user as a person in the research process. Time limits, failing technology, double room bookings, bad acoustics or lighting, interruptions, late arrivals, disorganised paperwork are all elements to be expected and some can be planned for and others cannot. The best of researchers can be focused on the 'thing' they are testing and the participant is the route to an outcome with the 'thing', however if the sessions are tightly planned and look professional this can contribute positively to the user's experience. Understanding the importance of user experience and involvement is not the same as *having the time* to empathise with the user's perspective. Being able to put yourself in their shoes and see through their eyes can be a significant step to real participation and improved

research. It begins before the study and follows through and after it and the best intentioned of researchers can be inevitably focussed on their research especially when working within tight academic time constraints.

Table IV. Checklist of Impact Factors on Effective Participation and User Comfort

Impact Factors: Effective Participation	Researcher Responses and Solutions
Practical/Administrative	Preparation, paperwork for people visiting: pre & post-communication, practicalities, barriers e.g. financial impact
Ease/Comfort	Environmental impact on behaviour. Place - physical and social
Structural	Appropriate support e.g. turning space; magnification
Temporal	Expect: delays, time restraints, delays and mishits. Flexibility of timing to fit users. Researcher time to plan.
Relationship Building	Communication/Language. Body language. Facial expressions
Know Your User	Age appropriate (analogies, comparisons/ methodologies) Cultural reference points (relevance /context)
Personality Know Yourself	Assumptions, Attitudes, Use of jargon, Dress Interpersonal skills - coping strategy
Social Interactions	Professional manner in 'controlled conditions' <i>finely balanced</i> with 'approachable and friendly'

5.3 Recruitment to the SiDE User Pool

We found that in working with older adults on digital inclusion research in particular, talking to them proved to be most effective in recruiting representative participants. This was also true of recruiting people from the pool for specific studies. Initial recruitment strategies using posters and newspaper advertising resulted in high numbers of volunteers but many did not fit the explicit criteria cited for many of our research studies [Greig, 1994]. Travelling into different neighbourhoods and talking to groups from various local communities expanded the range of gender and socioeconomic backgrounds within the pool, and laid the foundation of the relationship building we identified as the basis for the success of our participation and retention levels. As the User Pool grew, suitable people were more likely to be found from that larger pool and through the data gathering sessions (such as through conducting the CREATE battery, 3.3.) where the manager could identify participant characteristics, visually and through conversation. However, it has remained the case throughout, that further recruitment is always needed to get participants with specific disability, age, and technical ability and established relationships with relevant organisations are the route to easing this process.

5.4 Data Gathering

Data gathering worked best when it was controlled, adopting a uniformly consistent system of collection, scoring and storage such as had been established by the CREATE team. The successful administration of these testing sessions was without doubt in the preparation and planning of the paperwork, the environmental setting and using two people to administer them. There was a very clear process requiring tight management to ensure participants' comprehension, with a rigorous system to safeguard anonymity and make certain that paperwork was fully completed by all, including careful collation of exercises and questionnaires to avoid mix up of identities. The CREATE guidelines are very specific and comprehensive in their attention to detail, making the process as universal as possible. It is a real lesson in how to set up and run a very tight study with a large number of people. The process involved inviting groups of around 15-20 people in for a morning or an afternoon (2-3 hours depending on the group) using a strict protocol for administering the paper-based measures of questionnaires, tests and exercises, including established comfort breaks between measures. We also took these out to neighbourhood centres, to streamline the time it took to schedule large numbers of people to visit us. Prior to the testing and during the breaks, the User Pool manager used these sessions to get to know the participants.

The better the User Pool data, the easier (and speedier) to find a fit and secure wide participant representation therefore aligning information from various measures, metrics and scorings is a crucial element for the development of a database built to manage a large user pool. In SiDE the wide range of research and accompanying individual independent researchers with different agendas and interests, collecting disparate data, using different methodologies on varying numbers and combinations of participants, made cross referencing of information complex. Collecting quantitative and qualitative data offers rich information that can inform recruitment more effectively and this together with information gathered through telephone conversations and talking to people before, and after studies built up the type of information it is often hard to ask about. However it was through relationship building that people were more open regarding specific accessibility characteristics that a researcher might require. In the case of the SiDE User Pool, the manager made use of this group experience, knowing how demanding the cognitive tests were and that the group's common reactions sparked conversations through a shared experience, especially during the breaks. Where, when and if appropriate, it allowed the manager to take advantage of a social situation and talk about other research projects and the kinds of people she might be looking for. This very often resulted in people, who fitted 'hard to identify' criteria, volunteering themselves or someone they knew, whom they would refer to the project if interested. Clearly those who did not want to reveal a characteristic were under no obligation to do so. It was in this way however we often identified people fitting a very specific requirement which would be difficult to advertise for or to find from the existing information in the SiDE User Pool, e.g., *'participants aged over 65 with a mild hand tremor and some experience of touch screen devices'*. This approach comes with the strong warning that such a recruitment style needs to be done sensitively, only when confident of the safety net of a reasonable relationship, a level of familiarity and/or clear authority. This element of participant data was created from the knowledge the pool manager built up through relationships formed over 5 years. Such personal information was a challenge to manage and for ethical reasons not a formal part of the database, but through minimal coding or a note it could be used to inform participation or non-participation. For example a note on a user to avoid for eye tracker studies, as it inexplicably would not track him, would simply note 'no eye tracking'; users with a head or hand tremor unable to participate in certain experiments would only be apparent to the manager through the study they were perfect for; shy people reluctant in group work would have a note to state their preference for another type of study; enthusiastic users who would attend every study if allowed would have no code but remain manager knowledge; a note with unavailable dates for people who were ill or wanted time out; people who reveal a misunderstanding and fail the criteria might need a code re an impairment or a simple note on technology use or non-use; people known to have signs of early onset dementia, confirmed by spouse would be coded but continue to receive newsletters and invited to any open events; enthusiasts of certain technologies would be openly noted; people in support groups for certain conditions were usually happy to be known for their activities and if not would be coded. Other notes were used by the manager to remind her of simple background information such as when and where they were recruited so that in conversation she could rekindle the relationship, as over time people forget they volunteered and want an explanation of where and when they were recruited and are reassured when they can be easily reminded.

As noted above the knowledge accrued was sometimes not recorded or the coding would only make sense to the manager. In some cases, although the information was open and available, it could not be easily found by a researcher as it had not been coded. The time was never found to develop, for example, the metadata of individual interviews and much of the rich information that could be found in those stories remained contained within long narratives. An enthusiastic user of email for instance only came to light when interviewed and although it is openly available, not all researchers might search each interview to identify more participants that fit their criteria so explicitly. The user would be identified as an email user but only through interview reveal the extent to which the medium was utilised to organise worldwide events including clan gatherings and the negotiation of reduced rates for these events. Thus the formal classifying of themes and subthemes to create meaningful metadata for general searchers of the database would need to be addressed in any future

planning. In the case of the SiDE User Pool, the manager could often redress that gap for the SiDE researchers.

5.5 Participation Rationale: Reciprocity

An insight from recruiting over 800 people, and talking to around 500, is hearing a range of expressed reasons why people participated. No one was *in it for the money*. Although many were delighted to receive a £10 gift voucher for an hour's study, many were equally reluctant to receive any reward as they enjoyed 'taking part' and wanted to *give something back*. We specifically used gift vouchers in recognition of time and expense incurred by their participation, to avoid impact on tax or any benefits they might receive. We insisted that all participants take a voucher and were asked to donate it elsewhere if reluctant to accept it. A universal approach with the vouchers ensured everyone's comfort in choosing to either keep it or pass it on.

Recognizing the importance of reciprocity in relationships especially with older adults and people with disabilities is important for establishing as equal a relationship as possible in an unequal setting. Reciprocity is a norm that underpins social relationships [Gouldner, 1960; Lindley, 2008; Meurer, 2014] and is one reason why User Pool participants need to believe that their knowledge and input is worth listening to. They genuinely want to contribute and this is partly because it increases their feelings of autonomy within the research setting or to put it another way if participants feel they are objects of study they are less happy taking part, as people don't like to feel they are the problem. At the same time, in contemporary western society, the status of youth is high while that of older adults and people with a disability remains seriously low in comparison (Feng, 2001). Ageing is seen as 'a problem' to be addressed, with older people still regularly referred to as being 'a burden on the health service' specifically or society in general (Phillipson, 1998; Phillipson and Walker, 1986). Being participants and not being 'done to' is a key tenet of proper user centred research participation. The importance of autonomy and dignity is a significant aspect of reciprocity and can be undermined if people feel patronised or if the research study seems disorganized, does not make sense to them, their values or their understanding of where it fits into improving, in some way, the real world as they understand it.

In some cases participants reported taking part as personally rewarding, stating their hope that their research engagement might *further and advance knowledge*, so that *others might benefit* even if they don't personally. Meaningful activity, like taking part in research studies, gives some feeling of control over a condition, however limited. This is not particularly surprising feedback as it tended to come from people with chronic conditions, who were already motivated to set up, join or take part in support groups related to their condition such as Parkinson's, COPD or visual impairment. However, we also collected written feedback at a User Pool members event in February 2015 from participants with no particular personal investment who also reported feeling altruistic in their motivation to take part in research and together with feedback, following numerous activities over the five years, we can report this interest in making a difference and giving something back was important to our SiDE User Pool participants [Dee and Hanson, 2014].

One extreme example of building in reciprocal relationships evolved in a workshop with care home residents (mainly vulnerable) who had difficulty in either envisaging the context of the study or in comprehending how their opinions were relevant in a research study looking at the design of wearables for location logging devices. Here, researchers explored ways in which residents of care homes, who are more often 'done to' than other sections of the population, might be given a voice in the care home setting. They committed to a series of workshops to build up familiarity and a relationship to better support interaction and involvement. Residents were encouraged to bring something with personal meaning to the next workshop to aid individual design ideas. The workshops used arts and crafts to create an activity that was accessible; creating a relaxed setting to share stories in. Incorporating personal items gave each resident a visible meaningful device they could use to lead and share their own story, acting as a memory aid and a focus point as they remained the acknowledged expert of their own story. Maintaining ownership of their own contribution, with a captive audience, empowered them, and supported their identity

and confidence, as equal partners in the discussion [Nevay and Lim, 2015]. The delicacy of working 'in the field' in an environment with vulnerable participants, requires the most careful planning, as the level of participation will always be unpredictable with the serious danger of 'wearing out your welcome' (since relationship building takes time) and losing access to the research arena. Especially when the arena is first and foremost a home and secondly a serious working environment. The need to plan and see the world through the eyes of all stakeholders in such a setting is incredibly important throughout the research process.

Seeing the world through the eyes of the participants is difficult to maintain and harder for some than others. Individually the participants may not be 'equal' in terms of their (necessarily) time-limited contribution, however from a research perspective 'the whole is greater than the sum of the parts' and each part needs to feel valued and respected for their contribution to gain full participation. In accessibility research the following guidelines may be helpful in reminding researchers to see the research activity through the eyes of the users:

- Help participants to feel equal partners by acknowledging their experience.
 - Develop some familiarity with the technology issues they face to help you acknowledge and empathise with them.
 - Discover and acknowledge their area of expertise/experience.
- Manage social interaction with participants carefully and considerately
 - Be aware of the fine line between warm interest and conducting a professional study. The participant can be steered off track if too chatty when you both need to focus.
 - Find a balance by building in explicit time (5/10 minutes at the front and end of each session) for questions, pleasantries and time to show people in and out.
 - Use the environment to trigger different conversations, e.g. the walk to the 'lab' as social and the 'lab' as formal.

5.6 Vulnerable Participants and Accessibility Research

On a very few occasions we discovered a participant who gave consent to take part in a study but was clearly not cognitively able to perform the given task. In such cases we did not use that data and ensured they were not asked to take part in research again as our ethical consent did not anticipate work with such vulnerable people. Although our User Pool did not actively recruit vulnerable people, new studies are emerging where we would like to include for example the voice of residents in U.K. care homes. Our challenge is that many such residents are on the dementia spectrum with slight to severe cognitive impairment and anywhere in between. In trying to gain their views of the built environment they inhabit, we are trialling different ways of capturing their opinions.

In working with vulnerable people Godwin (2014) identified 3 themes as being important: 'Personalise', 'Clarity' and 'Context'. We would also add (and emphasise): 'Patience', 'Relationship building' and appropriate Methodologies. The themes listed below are also sound considerations for people involved in all accessibility research:

- Personalise:

Each stage of the consultation should be individually tailored, especially in accessibility work; tuning into their needs and levels of understanding

- Clarity:

The task needs to be communicated carefully, probably slowly and maybe repeated. This does not mean they are stupid but they are coming cold to something you have been living, breathing, planning and discussing.

People may need help in remembering what is involved (presuming you are not testing memory).

- Context:

The context is important for them to make sense of the process and the context should make sense to them.

Language needs to be age appropriate for the experiment to have meaning for the participant, e.g. beware of using slang or flippancy in a study title.

- Patience (allocate TIME to cope well with unpredictable problems).

Research studies are significant events in the life of a researcher but ‘parachuting’ users into the research world can have unforeseen consequences often frustrating researcher objectives.

- **Relationship Building:**

It is hard to build trust without some minimal level of a working relationship. Getting to know users’ anxieties and sensitivities is tantamount to learning how and what context will hook them into your work. Allowing some time to talk about the study and for them to ask questions leaves a little breathing space for clarifications.

- **Methodologies need careful consideration in work with vulnerable people:**
 - Dementia covers a wide spectrum of understanding and fluidity in ability which should not automatically stop inclusion.
 - Dementia impacts on literacy, the written word and cognition; so reading can be a problem for the participant. Talking through an exercise allows you to gauge comprehension and assess real and full consent.
 - Language needs to be jargon free. It is easy to slip into references to ‘browsers’, ‘software’ or ‘apps’. A reference to ‘social media’ means something else entirely to the lay person. Google may have become a common verb to you but be prepared to check your users’ understanding.
 - A clue may be that the need for many explanations means you may have disempowered your participant.
 - Short term memory loss and problems with recall mean that:
 - Conventional research interviews are too complex and may require creative alternatives such as ‘talking mats’ or word prompts using images or tailored games. One to one conversations or small groups, short focused chats using prompts such as photographs may be better.
 - Likert scales and questionnaires may also be too complex for users to decipher or work through.
 - Discourse Analysis is not appropriate where speech is sparse or non-existent although this is not always the case, there can often be the use of repetition and stock phrases.
 - Focus groups are limited for those with hearing problems and the ability to maintain a focus in order to follow the discussion.

5.7 SiDE User Pool as a Resource for Others

Not surprisingly, there have been requests over the years from other organisations to have access to the SiDE User Pool. As a UK Research Councils (RCUK) funded research effort, we did address requests by other RCUK research. Given the potential cross university benefits it could be argued that every university should be committing some funding to such a resource as is already the case in many medical schools. In our case funding to maintain the pool remains a challenge and our ability to support other researchers is limited.

At one point, there was consideration of whether it would make sense to provide the SiDE User Pool as a consultancy service to industry that needed user input. This was attempted one time. While experiences with other companies would undoubtedly vary, the participants’ experiences with the industry researchers led us to abandon the idea of a consultancy. As a valued resource, there was a need to treat participants with a high level of respect. As it was not possible to control the participant experience in consultancy as well as was possible with our SiDE researchers, the idea of consultancy was not pursued beyond the original trial.

6. MEETING OUR ORIGINAL GOALS

At the outset of this paper (Section 3), we mentioned that our initial goals for the SiDE User Pool were to provide ready access for researchers to appropriate study participants, to have background information available to identify likely participants, and to develop a group of participants who could interact with researchers throughout all phases of a research study. How well did we succeed at these goals?

Goal 1: Providing researchers with ready access to participants. In this respect, the SiDE User Pool was a very big success. To date, 694 members of the User Pool have participated in 42 studies involving 51 researchers. This work was conducted by

SiDE researchers at the University of Dundee and Newcastle University, as well as by collaborators from the Universities of Aberdeen and Glasgow. In many cases, researchers were able to begin testing within days of having received ethical approval. The large variety of study types undertaken (as shown in Table 2) attests to the suitability of the SiDE User Pool members for a variety of research.

Goal 2: Providing researchers with background information about participants. By and large, this goal was also met. Information such as age was readily available to researchers and in many cases results of cognitive tests and disability issues were used to pre-screen participants for studies. In some cases, however, researchers had specific requirements or needed tests not administered, so had to do these as part of their experimental protocol.

Goal 3: Providing researchers with representative user input throughout all stages of their research. In this goal, the SiDE User Pool was less successful. The original plan was to create a participant group that would help formulate research strategy, participate in research studies, and actively evaluate research outputs. The original objective was to get early feedback about problems the researchers were addressing, the importance of these problems to the target users, and a sense of solutions that the target users were to adopt. This would have established a project with the active involvement of older adults or disabled users working at a policy and process level to address issues of digital inclusion.

In practice many researcher energies were evaluation-driven. There was relatively little uptake from the researchers in terms of getting early user driven feedback at the ideas stage and even less in terms of working with the users to evaluate the research outputs. While users were briefed on study outcomes, this was not the same as actively seeking their advice about the outputs.

In looking at Section 4 of this paper, there were, however, three types of research that provided some of this early feedback. The first was the SiDE Workshop. This workshop gave researchers input at early stages of their thinking. The second, co-design workshops, solicited early feedback about the design of wearables to be used in research studies [Nevay 2014]. These workshops, however, were very targeted at designing comfortable devices for other research studies, so didn't involve the type of co-design that typically would involve asking participants about their interest in the solutions and how the solutions fit into their lives. The third set of studies that provided some early input were the focus group studies. These, too, however, tended to stop short of asking about needs, focussing instead on asking users specific questions about the design aspects of projects underway.

7. CONCLUSIONS

Our goal with this paper has been to share our experiences in managing a large group of research participants over several years. The User Pool itself was a resource to support SiDE research and never a research project in itself, as such this paper seeks to highlight our experience rather than deliver the results of an experiment. We hope that many of the lessons learned will assist others who wish to develop User Pools for extended research groups.

In particular, we highlight our experience in recruiting participants and their reasons for research participation. At least among the population we were recruiting, a main motivation related to reciprocity and contributing to scientific research.

We also note that that attention to the participants (at the time of study as well as keeping them informed) is crucial. In this regard, a User Pool manager with personal and organisational skills is essential at the very least in the initiation period. Face-to-face recruitment strategies were most effective compared to traditional marketing drives using the media and posters. Talking to groups and giving presentations allowed for a fuller understanding and engagement with the project principles for recruitment of a wide range of older adults. Relationship building was important in maintaining the longevity of the pool in the knowledge that recruitment was never going to be static. In terms of SiDE User Pool members' loyalty and retention, the comfort of, and sensitivity to, the needs of the user as an equal in the research process is an important and an on-going piece of work.

We note also, however, that having such a User Pool available does not guarantee that needed participants will always be readily available. In cases where researchers

required participants consistent with original recruitment criteria, the SiDE User Pool worked extremely well. As researchers wished to recruit specialised participant groups, however, the SiDE User Pool had to be expanded and having a manager and a recognisable motif, made this much more straightforward.

We wonder whether the involvement of users in published accessibility work should require more comprehensive description within research papers in order to demonstrate the level of involvement and the range of users in terms of their representativeness of the wider population. In concert with this we would be interested in the development of training and guidance for researchers embarking on user centred work and the kinds of support that could be set in place for those less confident in these areas.

In sum, our experience with the SiDE User Pool over the past several years has been – and continues to be – very positive. It is important to keep in mind, however, that these positive experiences require time and attention.

ACKNOWLEDGMENTS

We thank the members of the SiDE User Pool who gave so generously of their time, experience and ideas.

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Appendix 1:SiDE Marketing for Recruiting People into the User Pool

'MARKETING' and CALLS FOR SiDE USER POOL PARTICIPATION (3.1)	
CONTACT DETAILS: Name; Address; Telephone;	You want an agreement to be allowed to contact people and invite them to take part when a study arises. Basic contact details needed. Find out their preferred form of contact
Post Code	Indicator of social class
Mobile; email	Indicator of technology uptake
DATE OF BIRTH	CRITICAL criteria for our SiDE research studies. WHAT is your CRITICAL criteria?
GENDER	Aim for balance that reflects the wider population
PROJECT DESCRIPTION	Jargon free language Not patronising Not ageist Bear in mind the wide age range (60-100+) May need alternative marketing for different generations
PROJECT CONTACT DETAILS For people to contact you. Phone; email; postal; online registration.	Offer a variety of methods for them to make contact with you including personal and impersonal. Offer a FREE option (e.g., Freepost)
TEXT to INVITE respondents to join This is very difficult and needs some level of testing with different generations see: 3.1 We did Newspaper adverts, posters and leaflets but talking and explaining worked best as individuals interpret words differently. You want people to understand they are the group you want in your pool (they may believe they do not fit the criteria). People de-select themselves especially if they feel they are not capable. No one wants to be seen to fail. Empathy for those who might believe they are not your target; using specific descriptions or images can help	Word limits – needs to be quickly understood or they won't read it. NOTE off-putting trigger words, e.g., 'University', 'Research', 'Technology' Think how to 'dilute' these if you have to include them. Use accessible descriptions, e.g., appeal to those who have low technology confidence e.g., microwave or remote control. Appeal to those who love technology using examples like Wii or Twitter etc., Use empathy for 'inbetweeners', reference to Using a mouse, charging phone batteries or online shopping or bookings. Emphasise the need for their experience, knowledge and feedback to counter the possible barrier to joining 'academic research'
IMAGES Use real people to represent your target group(s). Not sleek marketing representations or clipart. Want people to see themselves and know they are part of the target group	Include images of people playing with or struggling with the concept you wish to engage over. We included people using everyday technologies to illustrate they already use technology and what we meant by 'technology'.

Appendix 2: SiDE Hub User Pool Request Form



Social inclusion through the digital economy

Please allow plenty of planning time in order to schedule research activity dates and appropriate space for interaction with the participants to take place. Add extra sheets if required.

Named Investigators:

Contact Details:

Title and description of your Research Proposal (include here **who** is running the study, **where** it will take place, **numbers** and **profile** of the research participants required, etc.,)

Dates of Proposed Research Activity – give details of timeline:

Methodologies: Including planned media use, e.g., film; photographs; audio-recording etc.,

Ethical Approval:

Do you already have ethical approval from this/another institution? YES NO PENDING

If 'No' do you require help with this? (If 'yes' email: mbdee@dundee.ac.uk)

Signed (or online equivalent):

Print Name:

Supervisor's Signature:

Date:

The above details give us a basis from which to draw together a relevant group of participants. As soon as the request has been approved we will be in contact in order to plan the research activity in more detail. Please ensure the relevant contact details are included so that this can take place. **Please read the terms and conditions overleaf and sign them before returning the request form.**

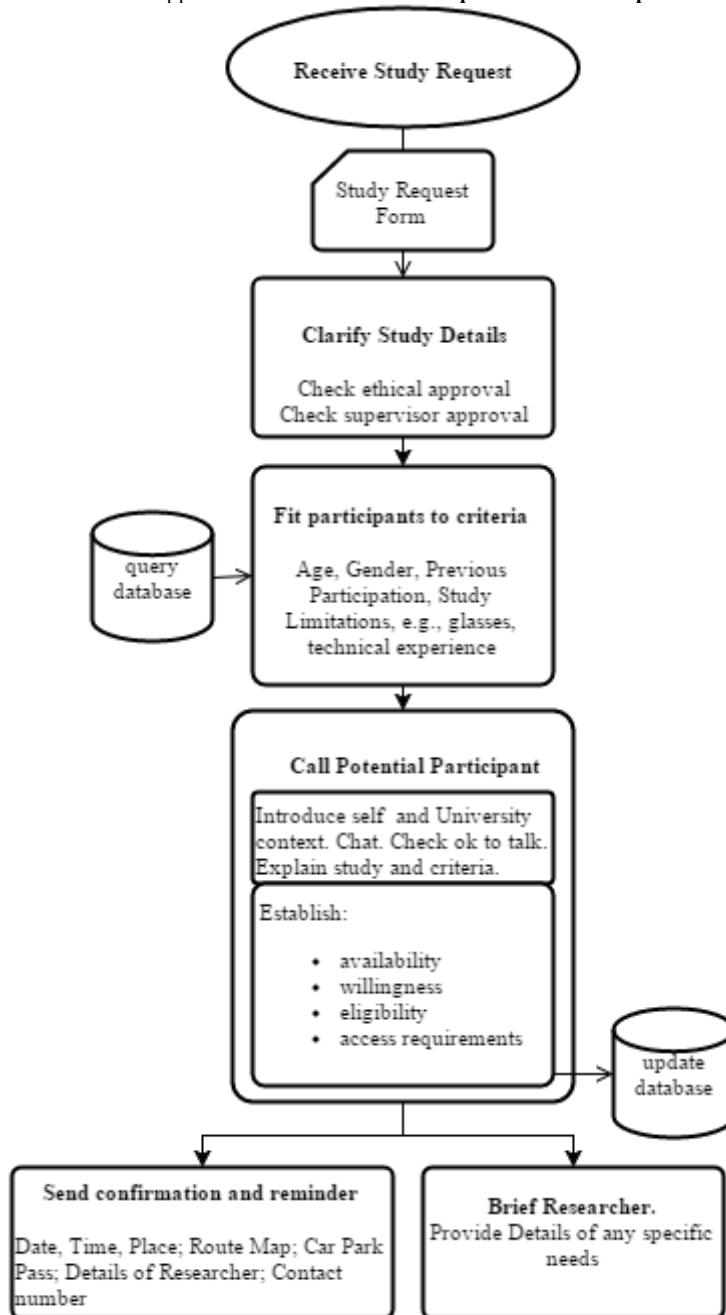
Terms and Conditions

1. Ethical approval is required in order to run a study with participants from the Research Pool.
2. Completion of this Research Pool request form is necessary and it should be emailed to: mbdee@dundee.ac.uk with a copy of your ethical approval.
3. Once this form has been received, and your information complies with our requirements, you will be contacted to clarify your request including the process of recruitment, user participation and any financial cost.
4. We will use the description of your project on our website as information for our research pool in order to keep them informed and in touch with the variety and range of research studies supported by the pool. You may wish to consider this when describing your study to us.
5. You are responsible for participant payment in the form of a gift voucher. We advise a voucher of £10 for research participation lasting an hour (or part thereof). Research that requires extended time on the part the participant(s) should consider equivalent fees on a case by case basis.
6. The SiDE Research Pool exists, in part, due to the good will and generosity of its members. We reserve the right to withdraw access to the SiDE Research Pool in the case of inappropriate behaviour or negative feedback from the participants. Failure to adhere to agreed timings / venues may result in a similar penalty.
7. All research reports, academic papers and other publications must acknowledge support from the RCUK grant EP/G066019/1

Signed (or online equivalent):

Print Name:

Appendix 3: **Flow Chart: Request for Participants from the User Pool.**



Appendix 4: **Flow Chart: Bringing Users in for a Study.**

